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RESIN-SEALING TYPE SEMICONDUCTOR DEVICE

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[There are no amendments to this utility model.]

Claim

A resin-sealing type semiconductor device characterized by the fact that in this resin-sealing type semiconductor device, which has only the upper half surface containing the cross-sections of a semiconductor chip and a lead frame sealed with a resin,

the width of the upper surface of said lead frame in contact with the sealing resin is larger than the width of the lower surface.

Detailed explanation of the model

Abstract

This device pertains to the shape of a lead frame used in a resin-sealing type semiconductor device.

The objective of this device is to improve the adherence between the sealing resin and the lead frame.

This device provides a resin-sealing type semiconductor device characterized by the fact that in this resin-sealing type semiconductor device, which has only the upper half surface containing the cross-sections of a semiconductor chip and a lead frame sealed with a resin,

the width of the upper surface of said lead frame in contact with the sealing resin is larger than the width of the lower surface.

Industrial application field

This device pertains to a resin-sealing type semiconductor device. Especially, this invention pertains to the shape of the lead frame used in the resin-sealing type semiconductor device.

In recent years, with progress in size reduction and quality improvement of various types of control equipment and home appliances, there has been a demand for reduction of the thickness and improvement of the reliability of resin-sealing type semiconductor devices used in said control equipment.

Prior art

Figure 4 is a cross-sectional view illustrating a conventional resin-sealing type semiconductor device. Semiconductor chip (2) is bonded and fixed on element carrying portion (1), and semiconductor chip (2) is connected to the tips of lead frame (3) with bonding wires (4). Then, sealing resin (5) is applied to fix them integrally so as to protect the semiconductor chip from mechanical impact from the outside or from the external atmosphere. Recently, however, the scheme shown in Figure 3 has been proposed. In this scheme, only the upper half surface containing the cross-sections of semiconductor chip (2) and lead frame (3) is sealed with a resin, while the resin below lead frame (3) is omitted. Compared with the conventional scheme, the thickness is decreased. On the other hand, however, the following problems arise.

Problems to be solved by the invention

Usually, adherence between the lead frame and the sealing resin is prone to degradation due to differences in the thermal expansion coefficient, etc. As a result, moisture or impurities may invade through minute gaps at the interface between the lead frame and the sealing resin to influence the characteristics of the semiconductor chip. This is undesired. Also, when a significant mechanical impact is applied from the outside or a high heat impact is applied due to soldering or the like, the sealing resin may fall off and separate from the lead frame, leading to problems. For the thin package shown in Figure 3, because the adherence area between lead frame (3) and sealing resin (5) is smaller than that shown in Figure 4, the adherence is even weaker, and the aforementioned problems may occur even more easily. Especially, when an external force pulling sealing resin (5) and lead frame (3) in the up/down direction acts, sealing resin (5) is prone to fall from lead frame (3), leading to degradation in the reliability of the semiconductor device.

The objective of this device is to improve the adherence between the sealing resin and the lead frame.

Means to solve the problems

In order to solve the aforementioned problems, this device provides a resin-sealing type semiconductor device characterized by the fact that in this resin-sealing type semiconductor device, which has only the upper half surface containing the cross-sections of a semiconductor chip and a lead frame sealed with a resin, the width of the upper surface of said lead frame in contact with the sealing resin is larger than the width of the lower surface.

Operation

According to this device, when an external force acts to separate the sealing resin and lead frame in the vertical direction, the sealing resin is caught on the upper surface of the lead frame to stop its removal. Consequently, the resistance to mechanical impact can be improved over the prior art.

Application examples

Figures 1(a), (b) are diagrams illustrating an application example of this device. Figure 1(a) is a cross-sectional view, and Figure 1(b) is its AA' side view. The same part numbers as those in Figure 4 are adopted. In order for the width of the upper surface of lead frame (3) to be larger than that of the lower surface, for example, a metal plate is tightly sandwiched between two lead frame shape patterns having different shapes and areas, and etching is performed for the metal plate with said patterns as masks. After lead frame (3) formed in this way is connected to

semiconductor chip (2) bonded on element carrying portion (1) with bonding wires (4), the unit is kept in a cavity (not shown in the figure) formed from the upper die and lower die of a molding die set, so that lower surface C of lead frame (3) is adhered to the lower die of said molding die set to prevent rotation of the resin. In this state, a resin is injected into the cavity for molding.

In this device, it is only required that the width of the upper surface of lead frame (3) be larger than the width of the lower surface, and the cross-sectional shape may vary due to differences in manufacturing methods of the lead frame. Figures 2(a), (b) are side views of lead frames (3) in other application examples of this device, and they correspond to the AA' side view in Figure 1(b). Figure 2(a) is prepared similar to said application example, that is, a metal plate is sandwiched between two lead frame shape patterns having different shapes and areas, and etching is performed with said patterns used as masks. The difference in the shape as compared to that shown in Figure 1(b) depends on the composition of the etching solution. Also, Figure 2(b) is prepared by individually pressing the two surfaces of a metal plate with dies having different shapes and areas.

Effect of the device

As explained above, according to this device, the mechanical adherence between the sealing resin and the lead frame is improved. Consequently, improvement in the reliability of the thin resin-sealing type semiconductor device is effected.

Brief description of the figures

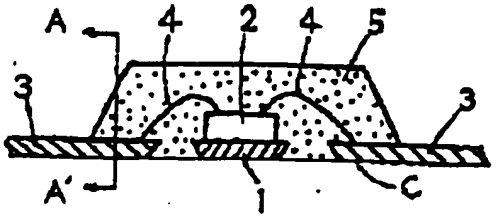
Figure 1 is a diagram illustrating an application example of this device.

Figure 2 is a side view illustrating another application example of this device.

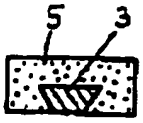
Figures 3 and 4 are cross-sectional views illustrating problems of the prior art .

Explanation of symbols in the figures

1 Element carrying portion
2 Semiconductor chip
3 Lead frame
4 Bonding wire
5 Sealing resin



(a) cross-sectional view



(b) AA' side view

Figure 1. An application example of this device.

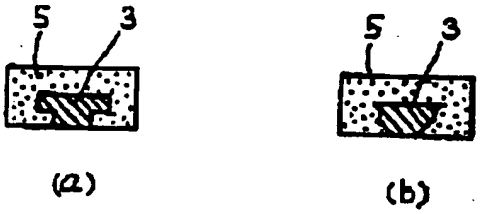


Figure 2. Side views illustrating other application examples of this device.

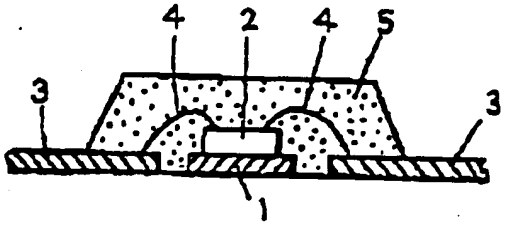


Figure 3. Cross-sectional view illustrating problems of the prior art.

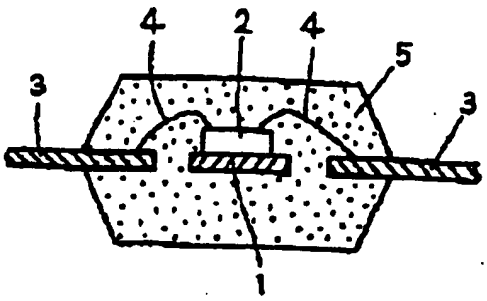


Figure 4. Cross-sectional view illustrating problems of the prior art.